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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/809,663	03/15/2001	Mukesh V. Khare	FIS920000396US1 / 130-000	5741
32074	7590	04/30/2004	EXAMINER TOLEDO, FERNANDO L	
INTERNATIONAL BUSINESS MACHINES CORPORATION DEPT. 18G BLDG. 300-482 2070 ROUTE 52 HOPEWELL JUNCTION, NY 12533			ART UNIT 2823	
PAPER NUMBER				

DATE MAILED: 04/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

09/809,663

**Applicant(s)**

KHARE ET AL.

**Examiner**

Fernando L. Toledo

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 17 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 6-8 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 6-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Remarks***

1. In view of the Appeal Brief filed on 17 February 2004, PROSECUTION IS HEREBY REOPENED. A new ground of rejection is set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

### ***Claim Rejections - 35 USC § 103***

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable by Kraft et al. (U. S. patent 6,136,654).

In re claim 1, Kraft in the U. S. patent 6,136,654; figures 1 – 8 and related text discloses forming an initial oxynitride layer 14 upon a substrate material, the oxynitride layer having an initial physical thickness (column 3, lines 52 – 56); subjecting the initial oxynitride layer to

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plasma nitridation, the plasma nitridation resulting in final oxynitride layer, the final oxynitride layer having a final physical thickness (column 3, lines 59 – 67 and column 4, lines 1 – 11); wherein the final oxynitride layer has a nitrogen concentration of 0.1 to 57 atomic % (column 5, lines 24 – 28); wherein the final oxynitride layer has an equivalent oxide thickness of less than 15 Å and a nitrogen concentration of at least  $2.0 \times 10^{15}$  atoms/cm<sup>2</sup> (figure 7).

Kraft teaches an overlapping of ranges. Kraft does not teach a specific example of oxynitride. However, the overlapping ranges do show that the expected results of the instant application could be achieved (See MPEP §2144.05).

4. In re claim 2, Kraft does not show wherein the final physical thickness exceeds the initial thickness by less than 5 Å.

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the final physical thickness exceeds the initial thickness by less than 5 Å in the invention of Kraft, since insulation thicknesses are well-known process variables and finding the optimum or workable ranges of those thicknesses requires only ordinary skill in the art. Note that the specification contains no disclosure of either the critical nature of the claimed thicknesses or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen thicknesses or upon another variable recited in a claim, the Applicant must show that the chosen thicknesses are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

5. In re claim 3, Kraft does not disclose wherein the final physical thickness is less than 20 Å.

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the final physical thickness less than 20 Å in the invention of Kraft, since insulation thicknesses are well-known process variables and finding the optimum or workable ranges of those thicknesses requires only ordinary skill in the art. Note that the specification contains no disclosure of either the critical nature of the claimed thicknesses or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen thicknesses or upon another variable recited in a claim, the Applicant must show that the chosen thicknesses are critical. *In re Woodruf*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

5. Claims 6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kraft as applied to claims 1 and 5 above, and further in view of Ito et al. (U. S. patent 4,980,307).

In re claim 6, Kraft does not teach wherein the initial oxynitride layer is formed upon the substrate by ionically implanting nitrogen atoms into the substrate and oxidizing the substrate, following the substrate being ionically implanted with nitrogen atoms.

However, Ito in the U. S. patent 4,980,307 discloses forming an oxynitride layer wherein the substrate is nitrated (by plasma) followed by an oxidation treatment, which allows for an increased thickness of the initial oxynitride layer (columns 6 and 7).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the initial oxynitride of Kraft by the method of Ito since it allows for an increased thickness of the initial oxynitride layer.

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6. In re claim 8, Kraft in view of Ito does not show wherein the final oxynitride layer further has a reduction effective electron mobility,  $\mu_{\text{eff}}$ , of less than 20% from the effective electron mobility of the initial oxynitride layer.

However, since Kraft in view of Ito disclose the invention it would have been obvious to one having ordinary skill in the art at the time the invention was made to achieve the same reduction in effective electron mobility since the effective electron mobility is a direct result of the formation of the final oxynitride layer.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kraft as applied to claims 1 and 5 above, and further in view of Gusev et al. ("Growth and characterization of ultrathin nitrided silicon oxide films" pp 1 – 22).

Kraft does not disclose wherein the initial oxynitride layer is formed upon the substrate by rapid thermal nitric oxide deposition.

However, Gusev in the article "Growth and Characterization of Ultrathin Nitrided Silicon Oxide Films, pp 1 – 22 discloses that by forming the oxynitride film with a rapid thermal nitric oxide deposition, the nitrogen is more effectively incorporated in the dielectric film than by using  $\text{N}_2$  or  $\text{N}_2\text{O}$  (pages 8 and 9).

Therefore It would have been obvious to one having ordinary skill in the art at the time the invention was made to form the initial oxynitride film of Kraft by the method of Gusev, because the nitrogen is more effectively incorporated in the dielectric film than by using  $\text{N}_2$  or  $\text{N}_2\text{O}$ .

### ***Response to Arguments***

7. Applicant's arguments regarding the inherency rejection were persuasive. However, the invention of Kraft does show the ranges of the claimed invention and hence overlaps on the claimed results.

8. Applicant also contests that the oxynitride layer in the instant application is different from that of the teachings of Kraft in that it is a heavily nitrified oxynitride layer. However, such a limitation is not found in any of the claims. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., a heavily nitrified oxynitride) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fernando L. Toledo whose telephone number is 571-272-1867. The examiner can normally be reached on Mon-Thu 7am to 5:30pm.

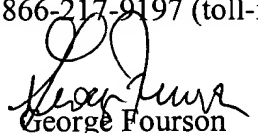
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



FToledo  
27 April 2004



George Fourson  
Primary Examiner  
Art Unit 2823